Bushy tank are:—effective length, 500 feet; depth of water, 12·5 feet; breadth of water, 30 feet; area of cross-section, 40 square yards; breadth of building, 42 feet; breadth of carriage, 31 feet; weight of carriage, 10 tons; velocity of carriage, 25 feet per second; horse-power on carriage, 50. The opinions expressed by the members at the meeting indicate that they are satisfied that these dimensions will amply provide for, not only ordinary commercial problems, but also for any special problems that may arise. One of the first systematic researches after the tank has settled down to its work will be the investigation of the many propeller problems regarding which little or no knowledge exists.

RURAL EDUCATION IN ITS VARIOUS GRADES.

THIS subject was discussed at a conference of the County Councils' Association held at Caxton Hall, Westminster, on March 31, under the presidency of Mr. Henry Hobhouse. The conference had been convened at the request of the Central Land Association, the Central Chamber of Agriculture, and the Farmers' Club, and was in every sense thoroughly representative.

A resolution was moved by Sir J. Cockburn to the effect that local education authorities should aim at securing better instruction in rural subjects, and that the teaching should be adapted to the circumstances of country life; school gardens and equipment for manual instruction should be provided, and elementary-school teachers should be specially trained for their work. The resolution was referred to a special committee.

To those unacquainted with country schools it must come as a surprise that such a resolution should be necessary nearly forty years after elementary education became the business of a Government department. Yet, as a matter of fact, it is only within quite recent years that the education of the country child has begun to have any sort of relation to his environment; he has been taught the same subjects as the town child, and in the same way, but often not quite as well. The teaching has been didactic, and has not necessarily involved any observation by the child of the things happening outside the school doors. For this the teacher has not been to blame, for country teachers, as a class, have as keen a professional spirit as town teachers, but the system has been at fault. Country children are sometimes said to be less intelligent than town children of the same class. This is emphatically not the case; on the contrary, the country child has often a larger stock of experience than the town child, and a proper system of education, based on his experience and dealing with the things about him, ought to give admirable results. It is much to be hoped that Sir J. Cockburn's resolution will be acted upon by those in authority.

After-education was also dealt with. The more promising children, it was urged, should be sent to secondary schools, where nature-study and elementary science teaching were given in close connection with practical work in the workshop and garden. The idea is admirable, but there would be considerable difficulty in getting to the school, especially in winter; while, if the children had to board at the school, the numbers would necessarily be very limited. Both elementary and secondary schools would remain under the Board of Education, but the more special agricultural education, the conference considered, should be dealt with by the Board of Agriculture. It was proposed that each group of counties should be connected with some agricultural college, which should be responsible for educating the students sent there, and for giving lectures and other instruction to farmers who cannot attend college. This system is already at work in some places, and was discussed in NATURE for March 25.

It will be observed that the resolutions were very comprehensive in their scope, and adequately covered the various problems of rural education. Whether the Boards of Education and of Agriculture could carry through so bold a scheme remains to be seen; it is undoubtedly to the interests of rural districts that they should.

To those wishing to learn the present position of higher agricultural education in England, a White Paper (Cd. 4569) issued by the Board of Education, giving certain tables of expenditure, will be useful. It was not possible to ascertain the exact amount spent on higher agricultural education, because in many cases agriculture only forms part of the work, and a fine estimate of what it receives is impossible. The Board of Agriculture grants are, of course, entirely *ad hoc*, but the Board of Education grants are for the whole institution. We find that the former Board gives 8800*l*. a year to colleges of university standing in England and 3350*l*. to smaller colleges and schools. The Board of Education gives 72,856*l*. and 25,496*l*. respectively. In one way and another the County Council grants must be considerable, but as a whole institution is often involved it is impossible to work out the exact share that agriculture gets. Four counties, viz. Bucks, Cumberland, Herefordshire, and Wiltshire, all active in providing rural education, spend between them about 10,000*l*. annually. The paper goes on to point out that the Board of Education is prepared to give still higher grants when a properly coordinated scheme is submitted to it, and we should imagine that considerable advantage will be taken of the offer.

SOME MARINE AND FRESH-WATER ORGANISMS.

IN the first part of vol. xcii. of *Zeitschrift für wissenschaftliche Zoologie*, Mr. L. Luders gives a full description of the wonderful ostracod crustacean described by Müller in 1895 under the name of *Gigantocypris agassizi*, together with a brief reference to the second species of the same genus. The first evidence of the typical species was a specimen dredged in deep water off Prince Edward's Island during the cruise of the *Challenger*, which indicated a veritable giant in the group, the shell measuring no less than 25 mm. in length and 16 mm. in width. Of the soft parts only the head was preserved, but this and the shell were sufficient to indicate the distinctness of the species from all shallow-water forms, and it was suggested at the time that it might prove to represent a new family group. In 1891 other examples were dredged by the *Albatross* off the Pacific coast at depths of as much as 1700 fathoms, and these were duly described and named by G. W. Müller. Another specimen was obtained by the Prince of Monaco off the Azores, while later still several others were dredged in deep water by the *Valdivia*. It is these last which form the subject of Mr. Luders's paper, where full details of the external form and anatomy of the species are given. One of the specimens collected by the *Valdivia* was dredged in the Gulf of Guinea, while the others were obtained in widely separated localities. This, together with the structure of the shell, suggests that it is a deep-sea pelagic organism, which does not, like other ostracods, live in sand.

In connection with the foregoing may be conveniently noticed a paper by Dr. Esther Byrnes on the fresh-water species of Cyclops of Long Island, published in No. vii. of Cold Spring Harbour Monographs. The observations in this monograph, which are based on several years' work, have special reference to the variability displayed by the fresh-water species of these crustaceans. Those from Long Island agree generally with the forms from the western lakes, and indicate their wide distribution. Variation of a varietal type is strongly developed, but much more so in some species than in others; it attains its maximum in the forms inhabiting stagnant waters, which can only exist at all by the power of readily adapting themselves to environment. Size is largely dependent upon habitat.

The American snapping shrimps of the genus Synalpheus form the subject of a memoir by Mr. Henri Coutière, published as No. 1659 (vol. xxxvi., pp. 1–93) of the Proceedings of the U.S. National Museum. Previous to the appearance of this paper six American species of the group were nominally recognised, under the generic title of Alpheus, but the author is unable to retain more than three of these names. On the other hand, he names a considerable number of new species, not only from American waters, but from other parts of the world. In No. 1663 of the Proceedings of the U.S. National Museum (vol. xxxvi., pp. 173–7) Miss H. Richardson describes a specimen, from Wood's Holl,

Massachusetts, of the isopod crustacean *Ancinus depressus* (=*Noesa depressa*, Say), of which only two examples were previously known.

To the third part of the *Bergens Museum Aarbog* for 1908 Mr. Alf Wollebœk contributes an important and lavishly illustrated article on the decapod crustaceans of the North Atlantic and the Norwegian fiords. The article commences with an elaborate account, illustrated by eight out of the thirteen plates, of *Caloxaris crassipes*, for which the new subgeneric term Calocarides is proposed. The rest of the article is devoted to various species of Macrura, with special reference to their distribution, both horizontal and vertical, and their habits and life-histories.

In the serial last quoted, No. 1658 (vol. xxxv., pp. 681–727), Prof. C. C. Nutting reviews the alcyonarians of the coast of California, the paper being based on the collections obtained during the cruise of the *Albatross* in 1904. Out of a total of thirty-eight species, twenty are referable to the pennatulid group. Many of these species are described for the first time, and the memoir is illustrated with a large number of figures. The writer saw only two kinds of alcyonarians in shallow water—both pennatulids; and as the coast appears to form an ideal habitat for such organisms, their rarity requires explanation.

No. 2 of vol. vi. of the Zoological Publications of the University of California is devoted to the Leptomedusæ of the San Diego region. Of eleven species of these jelly-fish recognised by the author, Mr. H. B. Torrey, in the collection of the Marine Biological Association of San Diego, no fewer than ten are described as new, two of these indicating new generic types, namely Tiaropsidium and Phialopsis.

The last paper on our list is the first portion of a memoir by Mr. W. Gariaeff, of the Zoological Laboratory at Villafranca, on the histology of the central nervous system of the cephalopods, published in vol. cxii. of *Zeitschrift für wissenschaftliche Zoologie*. In this instance the author deals with *Octopus vulgaris*.

THE INFLUENCE OF MOISTURE ON CHEMICAL CHANGE.[1]

THE influence of a trace of water vapour on a chemical reaction was first noticed by Prof. H. B. Dixon in 1880. He found that it was possible to pass electric sparks in a mixture of carbon monoxide and oxygen without explosion if the mixture had been very carefully dried. Shortly afterwards Cowper proved that dried chlorine had little or no action on several metals. Further observations were made by Prof. Dixon's pupils, the author in 1884 showing that carbon could be heated red hot in dried oxygen, that sulphur, and even the very inflammable phosphorus, could be distilled in the same gas without burning. Later experiments proved that ammonia and hydrogen chloride gases could be mixed without uniting, and that the readily dissociated ammonium chloride could be converted into a true vapour, and sulphur trioxide could be crystallised on lime, provided always that moisture was, so far as possible, removed. In 1902 it was shown that tubes containing very dry and pure hydrogen and oxygen could be heated to redness without any explosion resulting, and in 1907 that nitrogen trioxide could exist in the gaseous state if carefully dried.

Taken altogether, some twenty-five simple chemical actions have been shown to be dependent on the presence of moisture, and a few only, the burning of cyanogen, carbon bisulphide, and some hydrocarbons, seem to take place as easily when dried as when moist. In 1893 Sir J. J. Thomson showed that a potential difference of 1200 volts was unable to cause the passage of electric sparks through very dry hydrogen, and in the same year the author was able to stop the passage of the discharge from an induction coil by carefully drying the gas between the platinum points.

The amount of water necessary for the bringing about of chemical action is extremely small, less, in all probability, than one part in three hundred thousand of the reacting gases. Many hypotheses have been suggested for the explanation of its action. Prof. Dixon believed, in the case of carbon monoxide and oxygen, that the water vapour acted as a carrier of oxygen by alternate reduction and re-oxidation of the hydrogen. Traube imagined an alternate formation and decomposition of hydrogen peroxide. Dr. Armstrong in 1884 suggested a theory of "reversed electrolysis," the impurity of the water vapour rendering it a conductor. Sir J. J. Thomson in 1893 published a paper showing that if the forces holding the atoms of a molecule together were electrical in their nature, these forces would be very much weakened in presence of liquid drops of any substance of high specific inductive capacity such as water.

In 1895 it was shown that the newly discovered Röntgen rays were able to cause a gas to become a conductor of electricity, and it was thought, at that time, that the molecules of the gas were split up into atoms by this agency. If this were so, it seemed likely that in these circumstances chemical action would take place in absence of water, but a joint paper of Prof. Dixon and the author, in 1896, showed that the Röntgen rays, at the ordinary temperature, had no measurable effect on the combination of dried gases. Since that time, however, the researches of J. J. Thomson, Rutherford, Townsend, and others have proved that the ionisation of gases is of a different character.[1] The negative ions are extremely small particles of the mass of about 1/1000th part of the mass of an atom of hydrogen, the positive ion being the residue, but whether it is the residue of a molecule or of an atom seems to be still doubtful.

With the view of illustrating the influence of ionisation of gases on chemical change, the author devised a new experiment. It is known that mercury vapour, in ordinary circumstances, contains only atoms of mercury, which exhibit little tendency to combine with oxygen. The vapour, however, is ionised in the mercury vapour lamp, and when the current is cut off and oxygen is admitted shortly afterwards, the mercury becomes covered with a layer of mercuric oxide. Since the temperature of the lamp is much below that at which ordinary mercury vapour combines with oxygen, it is evident that in this case ionisation can bring about chemical action.

It is probable that this ionisation of mercury is different from the ordinary ionisation of gases. It may be regarded as the splitting off of an electron from the atom as distinct from a molecule, and the charged atom of mercury can then enter into union with oxygen. The cases mentioned above of combustions in oxygen which are apparently unaffected by the absence of moisture are perhaps to be explained in the same way. The gases are readily broken up into their elements, and it has been shown that carbon bisulphide breaks up at a lower temperature than that required for its burning. When these gases are heated charged atoms are probably formed, capable of direct union with oxygen.

To test further the question as to whether the ionisation of molecules, as distinct from atoms, as in the case of mercury vapour, can bring about chemical change, some recent experiments have been performed in which radium bromide was used as the ionising agent. Small quantities of this salt, contained in open silica tubes, were sealed up in tubes containing mixtures of hydrogen and oxygen and carbon monoxide and oxygen, the gases being very dry in some cases and moist in others. In no case was any chemical action observed, although the tubes were allowed to stand at 20° for more than two months. By means of a vacuum gauge the combination of 1/10,000th of the whole could have been detected. Another experiment showed that radium bromide was able to produce ionisation in very dry air, so that the want of chemical action in the above experiments must have been due to the fact that ionisation cannot of itself produce chemical action. There remained, however, the possibility of ionisation increasing the rate of union of two gases which were otherwise under conditions which would produce a slow chemical action between them. The reaction between nitrous oxide and hydrogen was found to be a suitable one for investigation, since it takes place

[1] Abstract of the Wilde lecture, delivered before the Manchester Literary and Philosophical Society on March 9, by Dr. H. Brereton Baker, F.R.S.

[1] The author finds that liquid water invariably collects in tubes containing salts of radium, though these salts are not at all deliquescent. In one experiment 10 mg. of radium bromide increased in weight by 1·5 mg. when allowed to stand for two days in an atmosphere saturated with moisture at 0° C. Examination of the crystals under the microscope showed that their edges were quite sharp, showing that the absorption of water was not due to deliquescence.